CLAIMS:

1. A diagnostic method for predicting maintenance requirements in rotating equipment normally operating in loaded and unloaded conditions, the method including the following steps;

coupling a sensor to apparatus associated with said rotating equipment, said sensor being responsive to vibration in said apparatus to generate an electric signal;

obtaining a load signal from apparatus associated with said rotating equipment which is indicative of whether the rotating equipment is loaded;

sampling said electric signal when the rotating equipment is loaded over a predetermined sampling time interval to obtain a loaded electric signal $V\ell$;

sampling said electric signal when the rotating equipment is unloaded over a predetermined sampling time interval to obtain an unloaded electric signal $V\mu$; and

periodically displaying the relative magnitude between said loaded electric signal $V\ell$ and said unloaded electric signal $V\mu$ over an extended maintenance period of time, a maintenance inspection being required when the magnitude of the unloaded electric signal $V\mu$ exceeds the magnitude of the loaded electric signal $V\ell$.

2. A diagnostic method according to Claim 1 in which the sensor is selected from the group comprising a velometer and an accelerometer.

3. A diagnostic method according to Claim 1 in which the electric signal generated is either current or voltage.

4. A diagnostic method according to Claim 1 in which the sensor includes a piezoelectric crystal.

5. A diagnostic method according to Claim 1 in which the rotating equipment is a drive spindle for a work roll and the load signal is indicative of whether the work roll is applying pressure to a work piece or whether the work piece has exited the work roll.

6. A diagnostic method according to Claim 1 in which the electric signal is sampled during a sampling time interval selected to correspond to a predetermined vibration frequency range.

7. A diagnostic method according to Claim 6 in which the predetermined vibration frequency range during which the electric signal is sampled is 0 to 150 Hz for rotating equipment rotating at less than 100 revolutions per minute.

8. A diagnostic method according to Claim 6 in which the predetermined vibration frequency range during which the electric signal is sampled is 0 to 200 Hz for rotating equipment rotating at up to 700 revolutions per minute.

9. A diagnostic method according to Claim 6 in which the predetermined vibration frequency range during which the electric signal is sampled is 0 to 500 Hz for rotating equipment rotating at more than 1000 revolutions per minute.

10. A diagnostic method according to Claim 1 in which the said loaded electric signal $V\ell$ is sampled over a time interval of 10 seconds during which the rotating equipment is fully loaded.

11. A diagnostic method according to Claim 1 in which the said unloaded electric signal $V\mu$ is sampled over a time interval of 10 seconds during which the rotating equipment is unloaded.

12. A diagnostic method according to Claim 1 in which sampling of the unloaded electric signal $V\mu$ begins a predetermined period of time after the load signal indicates that the rotating equipment is not loaded.

13. A diagnostic method according to Claim 1 in which the loaded and unloaded electric signals $V\ell$ and $V\mu$ correspond to the maximum electric readings taken during said predetermined sampling time interval.

14. A diagnostic method according to Claim 1 in which electric readings corresponding to the loaded and unloaded electric signals $V\ell$ and $V\mu$ are averaged during said predetermined sampling time interval to generate an average electric signal.

15. A diagnostic method according to Claim 14 in which an alert signal corresponding to the

arithmetic ratio R between electric readings corresponding to $V\ell$ and $V\mu$ is generated and displayed visually.

16. A diagnostic method according to Claim 15 in which a daily average of the arithmetic ratio R is plotted over time.

17. A diagnostic method according to Claim 15 in which the natural logarithmic of the ratio R is plotted over time.

18. A diagnostic method according to either Claim 16 or 17 in which the slope of the plot is monitored.

19. A diagnostic method for predicting maintenance requirements in rotating equipment normally operating in loaded and unloaded conditions, the method including the following steps;

coupling a sensor to apparatus associated with said rotating equipment, said sensor being responsive to vibration in said apparatus to generate an electric signal;

obtaining a load signal from apparatus associated with said rotating equipment which is indicative of whether the rotating equipment is loaded;

calculating a range of average maximum and average minimum electric signal readings over a pre-selected sampling time interval for rotating equipment in a loaded condition;

calculating a range of average maximum and average minimum electrical signal readings over a pre-selected sampling time interval for rotating equipment which is not loaded;

calculating the natural log of the ratio of an average loaded to average unloaded range value to define a condition index;

periodically displaying the condition index over an extended maintenance period of time, a maintenance inspection being required when the condition index falls below a predefined threshold.